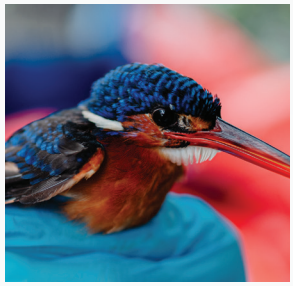
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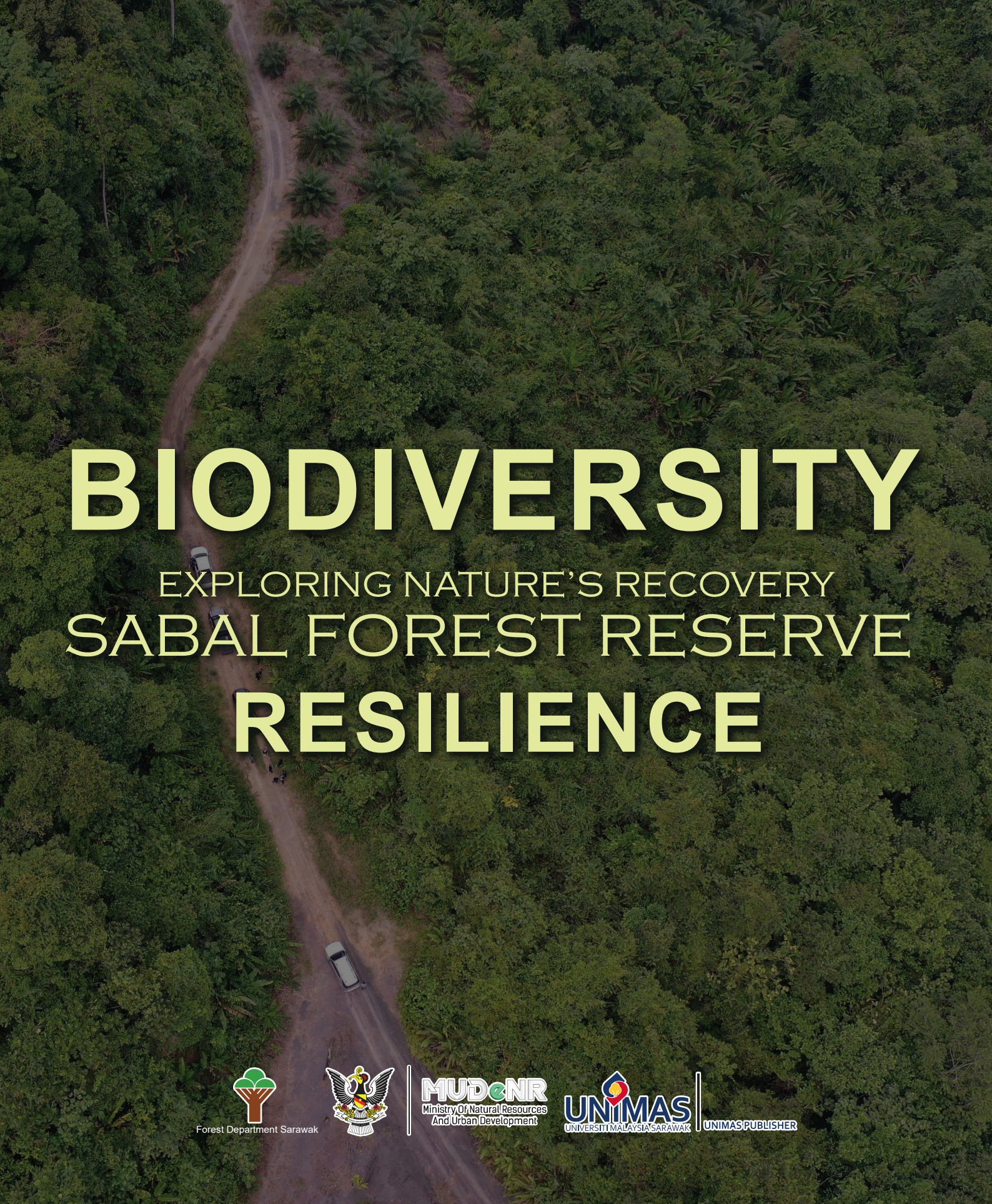





SABAL FOREST RESERVE

Edited By
Mohd Zacaery Khalik, Dayang Nuriza Abang Abdillah, Azahari Omar,
Runi Anak Sylvester Pungga, Meekiong Kalu, Faisal Ali Anwarali Khan

Forest Department Sarawak
MUDeNR Ministry Of Natural Resources And Urban Development
UNIMAS UNIVERSITI MALAYSIA SARAWAK



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By
Mohd Zacaery Khalik, Dayang Nuriza Abang Abdillah, Azahari Omar, Runi Anak Sylvester Pungga, Meekiong Kalu, Faisal Ali Anwarali Khan

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Table of Content

Foreword i
by Yang Berhormat Datuk Amar Awang Tengah Ali Hasan

Preface 1 ii
by YBhg. Datu Haji Hamden Mohammad

Preface 2 iii
by YBhg. Professor Dr Ahmad Hata Rasit

Introduction 2
by Meekiong Kalu, Mohd Effendi Wasli & Mohd Zacaery Khalik

Environment

Landscape Changes 6
by Siti Nurbaidzuri Reli, Nurul Hazlina Acheh, Muhammad Alif Muhaimin Muhammad Suhaimi & Nur Alis Sofiyyah Rosli

Water Quality and Solid Wastes 9
by Siti Akmar Khadijah Ab Rahim, Ruhana Hassan, Mustafa Kamal @ Harris Norman & Besar Ketol

Flora

Orchids 15
by Mohd Akmal Mohd Raffi, Meekiong Kalu, Zinnirah Shabdin, Haniza Razali, Yazid Kalbi, Ain Johari, Charlen Joyce Chakiris & Farah Alia Nordin.

Wild Gingers (Zingiberaceae) 19
by Meekiong Kalu, Mohd Akmal Mohd Raffi, Nur Sabrina Mohd Subri, Bernaddete Andriesse, Nurul Nurain Johari, Charlene Joyce Chakiris, Yazid Kalbi & Nur Safinas Jelani

Aroids 22

by Ruhana Hassan, Siti Akmar Khadijah Ab Rahim, Haris Norman & Besar Ketol

Endemic *Iguanura* Species (Arecaceae) 25

by Nur Sabrina Mohd Subri & Meekiong Kalu

Floristic Composition 29

by Aurelia Dulce Chung, Army anak Kapi, Romiller anak Jacob & Ahmad Faiz bin Zainol

Threatened and Endemic Tree 36

by Vilma Bodos

Timbers 43

by Teng Xin Yao, Nungah Anak Liang, Melvin Brown, Ronaldo Ak Odan & Mohammad Aizuddin Fahmi Bin Abdul Rafar @ Abdul Ghafar

Fauna

Plankton 51

by Ruhana Hassan, Siti Akmar Khadijah Ab Rahim, Haris Norman & Besar Ketol

Birds 56

by Ivana Berlinda Bilang, Belinda Carey Challen, Effa Fazirra Denis & Mohamad Fizl Sidq Ramji

Bats 62

by Asfa Hanis Mohamad Azmi, Nur Iylia Maisarah Baharom, Muhammad Amin Iman Azmi, Muhammad Danish Haqeem, Victor Lee Sien, Muhammad Iskandar Zamri, Alya Fathyn Sahibulfadillah, Ain Najwa Nazihah Razali, Khairun Nabihah Khairul Hamizi, Emy Ritta Jinggong, Natasha Anina Wanirzah, Huzal Irwan Husin & Faisal Ali Anwarali Khan

Non-volant Small Mammals 68

by Victor Lee Sien, Muhammad Amin Iman Azmi, Nur Iylia Maisarah Baharom, Muhammad Danish Haqeem, Asfa Hanis Mohamad Azmi, Alya Fathyn Sahibulfadillah, Ain Najwa Nazihah Razali, Muhammad Iskandar Zamri, Khairun Nabihah Khairul Hamizi, Emy Ritta Jinggong, Natasha Anina Wanirzan, Huzal Irwan Husin & Faisal Ali Anwarali Khan

Amphibians and Reptiles 73
by Elvy Quatrin Deka, Ramlah Zainudin, Joshua Kenneth Bilang, Zi Qi Lim, Nurhafiza Sisa, Chrislyn Mujan Donol, Nathaline Ping Wailyn & Amin bin Jais

Camera Trapping 81
by Shaffeqe Affendy bin Zakaria, Fatin Nur Azizah binti Ismuni, Wong anak Nyoher, Adrie Raden anak Dennise & Goswin anak Ruman

Fishes and Parasite Occurrence 87
by Badiozaman Sulaiman, Affif Luqman Bahrin, Nurzahidah Natasya Rosidi & Madinah Adrus

Crustaceans 92
by Shamrulazhar Bin Shamzir Kamal, Nur Dalila Diyana Binti Bandarsah, Nurul Zulaikha Az Zahra Binti Mohammad Adib, Herryson Rimmy Anak Hitam & Gebrielson Dayak Richard

Land Snails and Slugs 100
by Jie Ying Lee, Amira Fakihin binti Rostam, Irfan Haqqi bin Abd Razak, Elvina Harry, Al-Faizul Muawizatin & Mohd Zacaery Khalik

Carrion Flies 105
by Madinah Adrus, Zulhilmi Mohamad Ismail, Natalie Faithfany Henry, Nurul Farha Najwa Mohd Masdey & Nurul Ain Drahman

Lepidoptera and Odonata 109
by Ratnawati Hazali, Siti Nurlydia Sazali, Liu Siew Ying, Rafiq Hakimi Faizal, Gloria Chrissa Anak Gabriel, Foo May Sian, Nurfarida Anum Zainaddin, Nur Hidayatun Niesha Sapri, Ameirah Natasya Asfaromey & Mohamad Jalani Mortada

Termites 117
by Paulus Meleng, Princilla Leong, Mohammad Nafri Ali, Empenit Empawi, Whillander Lawrence & Allen Patta Andrew Bundak

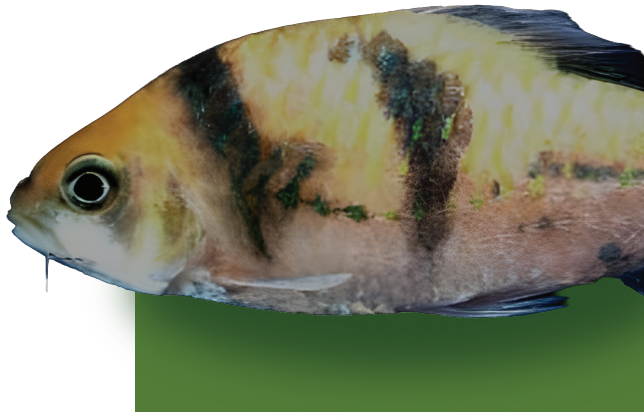
Beetles 122
by Siti Nurlydia Sazali, Ratnawati Hazali, Nur Hidayatun Niesha Sapri, Ameirah Natasya Asfaromey, Nurfarida Anum Zainaddin, Liu Siew Ying, Gloria Chrissa Gabriel, Rafiq Hakimi Faizal, Mohamad Jalani Mortada & Tan Wei Lim.

Contributors Affiliations 128

Editors 130

Fishes and Parasite Occurrence

Badiozaman Sulaiman, Affif Luqman Bahrin,
Nurzahidah Natasya Rosidi & Madinah Adrus



The rivers in Sarawak are known to host a diverse freshwater fish fauna, with past studies showing a high degree of occurrence of species endemic to the region. However, despite Sarawak's extensive river systems, much of its ichthyofaunal diversity remains under-explored and may face silent extinction in the face of rapid development and alterations to land and waterways. Hence, documenting fish diversity across Sarawak's major rivers is crucial for understanding species distributions, identifying populations at risk, and developing informed management strategies for Sarawak's fisheries. The Sabal Forest Reserve is located in Simunjan, Sarawak, and is part of the Batang Sadong river basin. The reserve encompasses headwaters that drain into smaller tributaries (Sungai Barai and Sungai Melikin) flowing toward the Batang Kerang floodplains, and potentially into Sungai Setabu along the northern most border, which drains into Sungai Simunjan. A previous study on freshwater fish diversity in the brown- and black-water habitats of the Batang Kerang Floodplain recorded a total of 36 species belonging to 13 families with Cyprinidae and Helostomatidae being the most dominant family recorded in both habitats respectively.

In this study, a rapid survey of freshwater fish was conducted in headwater streams running through forested and planted areas near the expedition base camp. Sampling was carried out from 24–28 November 2024 in conjunction with the Sabal Forest Landscape Restoration Centre's 2024 Open Day. A number of captured fish were also screened for ecto- and endoparasites to evaluate the prevalence of parasitic infection within the fish population. Sampling was conducted using scoop nets, hook-and-line, and baited minnow traps, with efforts focused on three distinct microhabitat conditions: (1) an intermittent

hilly stream section with slow-flowing, tannin-rich water that was assumed to be highly acidic, flowing between large boulders and over a mixture of rocky and sandy substrates within a forested area that drains into the perennial stream; (2) a perennial clear-water stream with predominantly gravel and cobble substrates, shallow riffles and runs, and deeper pools in areas with a greater abundance of large boulders, where the water appeared more tannin-coloured in sections with stagnant or slow-moving pools; the majority of the stretch was densely shaded by canopy; and (3) a more turbid section downstream of the forested area, flowing through an oil-palm plantation and characterized by a mix of open and partially shaded canopy, a higher frequency of runs and pools, increased sandy substrate, and exposure to irrigation runoff from the plantation. Overall, capture rates were relatively low due to frequent rainfall during the sampling period, and the rainy-season conditions likely influenced both stream characteristics and fish activity.

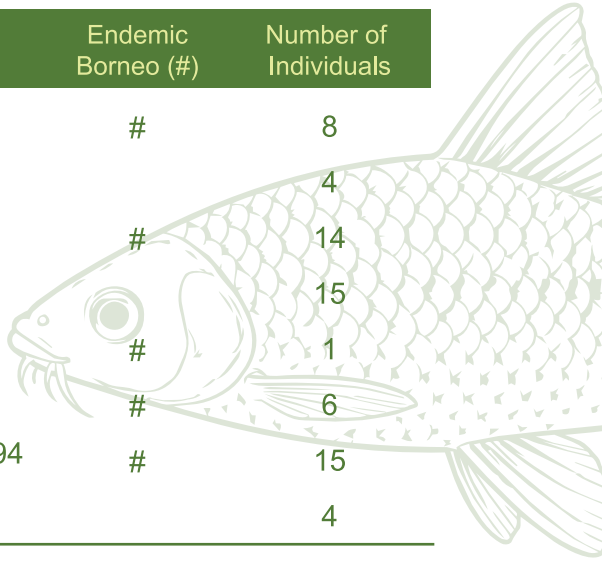


A total of 67 individual fish were caught, comprising eight species from four families, with Cyprinidae being the most dominant family (Table 1). Five of these — *Barbodes kuchingensis*, *Hampala lupar*, *Rasbora sarawakensis*, *Betta ibanorum*, and *Nemacheilus saravacensis* — are endemic to western Borneo, highlighting the unique aquatic biodiversity of the region despite the modest number of species typically associated with headwater streams in hilly habitats. *Hampala lu*par (previously *Hampala* cf. *macrolepidota*) was considered the highlight of this survey, as the species was newly described by Tan & Grinang in June 2025, and one individual collected in this study was included as a paratype (UNIMAS.P.00450). *Nemacheilus saravacensis, Rasbora caudimaculata,* and *Hampala lupar* were the most abundant species recorded; however, this does not accurately represent the true assemblage structure, as sampling was heavily hampered by persistent rainfall. The rain rendered baited traps less effective, resulting in catches biased toward species more susceptible to hook-and-line capture (*Rasbora* and *Hampala*) and scoop-net collection (*Nemacheilus*). The endemic species recorded reflect the ichthyofauna characteristic of southern Sarawak, located west of the Lupar Geological Divide, which separates the fish communities of southern and northern Sarawak river systems. *Betta ibanorum* and *Nemacheilus saravacensis* were found exclusively in microhabitat type 1; *Betta* occurred mainly along deeper

stream margins with root structures of riparian vegetation and submerged plant debris such as logs and decaying leaves, whereas *Nemacheilus* was concentrated in areas dominated by sandy substrates. *Clarias leiacanthus* occurred both in locations where *Betta* were found and in slow flowing and stagnant pools within the main perennial stream (microhabitat type 2). The remaining species were captured primarily within the main perennial stream. Only a single individual of *Rasbora sarawakensis* was recorded, found in the downstream stretch within the planted areas (microhabitat type 3). Although both *Barbodes* species appeared only moderately abundant based on captures, they were visibly more common in situ, frequently encountered in shoals of five to ten individuals and widely distributed in the runs and pools of the clear-water stretch. Notably, no species from the half-beak family (Hemiramphidae), particularly *Hemirhamphodon*, were recorded throughout the sampled reach, despite the group typically being associated with streams of this habitat type. While a previous study by Rahim et al. (2009) in the Batang Kerang river further downstream also did not record any Hemiramphidae, this absence was likely due to the use of gill nets, which are ineffective for capturing this family, rather than a true absence of half-beaks in the entire river basin.

Table 1. Fish species collected in Sabal Forest Reserve.

Family	Species Name	Endemic Borneo (#)	Number of Individuals
Cyprinidae	*Barbodes kuchingensis* Herre, 1940	#	8
	Barbodes banksi, Herre, 1940		4
	*Hampala lupar T*an & Grinang, 2025	#	14
	Rasbora caudimaculata Volz, 1903		15
	Rasbora sarawakensis Brittan, 1951	#	1
Osphronemidae	*Betta ibanorum* Tan & Ng, 2004	#	6
Balitoridae	*Nemacheilus saravacensis* Boulenger, 1894	#	15
Clariidae	*Clarias leiacanthus* Bleeker, 1851		4



Sixteen of the larger individuals across five species — *Barbodes kuchingensis* (n = 3), *Barbodes banksi* (n = 5), *Hampala lupar* (n = 3), *Rasbora caudimaculata* (n = 3), and *Clarias leiacanthus* (n = 2) — were also screened for ecto- and endoparasites (Table 2). Ectoparasite screening was carried out through visual examination using a magnifying glass, as well as by collecting skin mucus and examining it under a microscope at

20–600× magnification. Endoparasites were screened using flotation and sedimentation techniques, followed by staining with methyl blue and subsequent microscopic examination. Nematodes were detected in the guts of *Barbodes banksi, Hampala lupar*, and *Clarias leiacanthus*, whereas no ectoparasites were found in any of the screened individuals. The higher parasite detection in *Hampala lupar* and *Clarias leiacanthus* may reflect their higher trophic positions, which increase the likelihood of ingesting intermediate or paratenic hosts. Overall, this resulted in a prevalence of 18.75% (proportion of fish infected), an abundance of 0.38 (parasite density across the sampled population), and a frequency of 2 (average number of parasites per infected fish). The overall low occurrence of parasitic infection suggests a stable host–parasite relationship typical of a healthy natural freshwater ecosystem. However, increasing the number of fish examined and extending sampling into the dry season would provide a more accurate understanding of fish parasite diversity in the area.

Table 2. Prevalence, abundance, and frequency of parasite infestations on screened fish sub-samples.

FIsh species	Number of fish		Prevalence (%)	Abundance	Frequency
	examined	infested			
Barbodes kuchingensis	3	0	-	-	-
Barbodes banksi	5	2	40.0	0.4	0.2
Hampala lupar	3	2	66.7	0.7	2.0
Rasbora caudimaculata	3	0	-	-	-
Clarias leiacanthus	2	1	50.0	0.5	1.0



Hampala lupar



Barbodes banksi



Barbodes kuchingensis



Betta ibanorum



Nemacheilus saravacensis



Rasbora sarawakensis



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